

CLAIMS

1. A method of treating a metallic surface to provide an anticorrosive surface layer comprising contacting said metallic surface with an aqueous solution containing a sulfate providing agent, an oxidizing agent for said sulfate providing agent, an alkali metal permanganate, and an alkali metal carbonate so as to provide a passivating surface layer on said metallic surface substantially comprising manganese, oxygen, sulfur and carbon.

2. The method of claim 1 wherein said sulfate providing agent is selected from the group consisting of sulfuric acid and alkali metal persulfate.

3. The method of claim 1 wherein said sulfate providing agent comprises sulfuric acid and wherein said aqueous solution comprises a first aqueous solution comprising said sulfuric acid and said oxidizing agent, and including a second aqueous solution comprising said alkali metal carbonate and said alkali metal permanganate.

4. The method of claim 3 wherein said oxidizing agent comprises alkali metal permanganate.

5. The method of claim 3 wherein said oxidizing agent comprises ammonium persulfate.

6. The method of claim 1 including pretreating said metallic surface with a process selected from the group consisting of degreasing and nonmetallic contaminant removal.

7. The method of claim 6 wherein said nonmetallic contaminant removal comprises oxide removal.

8. The method of claim 3 wherein said first aqueous solution is provided by diluting 98% concentrated sulfuric acid to a concentration of between about 2 and 15 g/l of water.

9. The method of claim 8 wherein said first aqueous solution is provided by diluting 98% concentrated sulfuric acid to a concentration of about 5 g/l of water.

10. The method of claim 3 wherein said second aqueous solution includes said alkali metal carbonate at a concentration of from about 5 to 20 g/l of water.

11. The method of claim 10 wherein said second aqueous solution includes said alkali metal carbonate at a concentration of about 10 g/l of water.

12. The method of claim 3 wherein said second aqueous solution includes said alkali metal permanganate at a concentration of between about 2 and 15 g/l of water.

13. The method of claim 12 wherein said second aqueous solution includes said alkali metal permanganate at a concentration of about 5 g/l of water.

14. The method of claim 3 wherein said first aqueous solution is maintained at a temperature of between about 20 and 25° C.

15. The method of claim 14 wherein said second aqueous solution is maintained at a temperature of between about 20 and 25° C.

16. The method of claim 1 wherein said sulfate providing agent comprises alkali metal sulfate.

17. The method of claim 16 wherein said oxidizing agent comprises alkali metal permanganate.

18. The method of claim 17 including providing said alkali metal persulfate, said alkali metal permanganate and said alkali metal carbonate in the form of powders, and preparing said aqueous solution from said powders.

19. The method of claim 1 including treating said passivating surface layer by reducing said passivating surface layer with an aqueous acid solution.

20. The method of claim 19 wherein said aqueous acid solution comprises oxalic acid.

21. The method of claim 20 wherein said oxalic acid is maintained at a concentration of between about 5 and 50 g/l of water.

22. The method of claim 21 wherein said oxalic acid solution is maintained at a temperature of between about 20 and 30° C.

23. The method of claim 6 wherein said pretreating comprises degreasing said metallic surface with an alkaline detergent, pickling in an aqueous solution of sodium hydroxide, neutralizing in an aqueous solution of nitric acid, and rinsing.

24. The method of claim 23 wherein said degreasing is carried out at a temperature of between about 50 and 60° C.

25. The method of claim 23 wherein said pickling is carried out using said sodium hydroxide at a concentration of between about 3 and 10%.

26. The method of claim 25 wherein said pickling is carried out using said sodium hydroxide as a concentration of about 5%.

27. The method of claim 25 wherein said pickling is carried out at a temperature of between about 50 and 60° C.

28. The method of claim 23 wherein said neutralization is carried out using said nitric acid at a concentration of between about 10 and 30%.

29. The method of claim 28 wherein said neutralization is carried out using said nitric acid at a concentration of about 20%.

30. The method of claim 23 wherein said rinsing is carried out using water.

31. The method of claim 23 wherein said metallic surface comprises an aluminum alloy intended for rolling or extrusion.

32. The method of claim 1 including pretreating said metallic surface by contacting said metallic surface with an aqueous solution of nitric acid, phosphoric acid, and hydrofluoric acid.

33. The method of claim 32 wherein said metallic surface comprises an aluminum-based casting alloy.

34. The method of claim 32 wherein said nitric acid is provided by diluting approximately 65% concentrated nitric acid to a concentration of about 150 ml/l of water.

35. The method of claim 32 wherein said phosphoric acid is provided by diluting approximately 85% concentrated phosphoric acid to a concentration of about 800 ml/l of water.

36. The method of claim 32 wherein said hydrofluoric acid is provided by diluting approximately 40% concentrated hydrofluoric acid to a concentration of about 50 ml/l of water.

37. The method of claim 4 wherein said alkali metal permanganate is provided at a concentration of between about 2 and 15 g/l of water.

38. The method of claim 37 wherein said alkali metal permanganate is provided at a concentration of about 5 g/l of water.

39. The method of claim 37 carried out at a temperature of between about 20 and 25° C.

40. The method of claim 37 wherein said metallic surface comprises an aluminum alloy intended for rolling or extrusion.

41. The method of claim 5 wherein said ammonium persulfate is provided at a concentration of between about 20 and 60 g/l of water.

42. The method of claim 41 wherein said ammonium persulfate is provided at a concentration of about 40 g/l of water.

43. The method of claim 41 carried out at a temperature of between about 20 and 25° C.

44. The method of claim 41 wherein said metallic surface comprises an aluminum-based casting alloy.

45. The method of claim 1 wherein said alkali metal permanganate and said alkali metal carbonate comprise potassium permanganate and potassium carbonate.

46. The method of claim 2 wherein said alkali metal persulfate comprises potassium persulfate.

47. The method of claim 4 wherein said alkali metal permanganate comprises potassium permanganate.

48. An aqueous solution for treating a metallic surface to provide an anticorrosive surface comprising a sulfate providing agent, an oxidizing agent for said sulfate providing agent, an alkali metal permanganate, and an alkali metal carbonate whereby a passivating layer can be applied to said metallic surface substantially comprising manganese, oxygen, sulfur and carbon.

49. The aqueous solution of claim 48 wherein said sulfate providing agent is selected from the group consisting of sulfuric acid and alkali metal persulfate.

50. The aqueous solution of claim 48 wherein said sulfate providing agent comprises sulfuric acid and wherein said aqueous solution comprises a first aqueous solution comprising said sulfuric acid and said oxidizing agent, and including a second aqueous solution comprising said alkali metal carbonate and said alkali metal permanganate.

51. The aqueous solution of claim 50 wherein said oxidizing agent comprises alkali metal permanganate.

52. The aqueous solution of claim 50 wherein said oxidizing agent comprises ammonium persulfate.

53. The aqueous solution of claim 50 wherein said first aqueous solution comprises said sulfuric acid at a concentration of between about 2 and 15 g/l of water.

54. The aqueous solution of claim 53 wherein said first aqueous solution comprises said sulfuric acid at a concentration of about 5 g/l of water.

55. The aqueous solution of claim 50 wherein said second aqueous solution comprises said alkali metal carbonate at a concentration of between about 5 and 20 g/l of water.

56. The aqueous solution of claim 55 wherein said second aqueous solution comprises said alkali metal carbonate at a concentration of about 10 g/l of water.

57. The aqueous solution of claim 50 wherein said second aqueous solution comprises said alkali metal permanganate at a concentration of between about 2 and 15 g/l of water.

58. The aqueous solution of claim 57 wherein said second aqueous solution comprises said alkali metal permanganate at a concentration of about 5 g/l of water.

59. The aqueous solution of claim 48 wherein said alkali metal permanganate and said alkali metal carbonate comprise potassium permanganate and potassium carbonate.

60. The aqueous solution of claim 49 wherein said alkali metal persulfate comprises potassium persulfate.

61. The aqueous solution of claim 51 wherein said alkali metal permanganate comprises potassium permanganate.

62. A product including a metallic surface having a passivating layer provided by the method of claim 1.